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AUTHOR Mc Whinnie, Harold J.
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ABSTRACT

Data from a 1990-91 sample of professional art school students who were given The Spatial Dimensionality Test showed significant sex-related differences with higher male mean scores on spatial abilities tasks. These findings failed to replicate the 1987 data from the same sample that showed no significant sex-related differences on the same test measures of spatial abilities. This data is part of an ongoing research. (MM)

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A CONSIDERATION OF SEX RELATED DIFFERENCES IN THE SPATIAL ABILITIES OF ART STUDENTS

1990 data set

by

HAROLD J MC WHINNIE

College of Education

University of Maryland

College Park Md

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ABSTRACT

This paper reports specific data relative to the sex-related differences on tests of spatial abilities for a group of professional art school students.

The specific test data from our 1990-91 test sample showed significant sex-related differences on the spatial abilities test that favored higher male mean scores.

These observed differences are discussed with specific reference to:

a) a failure to replicate the findings in the 1987 data set from the same art school sample which showed no significant sex-related differences on the same battery of test measures of spatial abilities.

b) implications for the artistic education of the female art student.

c) implications from the 1990 data set for future research with The Spatial Dimensionality Test.

This data is discussed as a part of the ongoing research study which was begun by Eliot in 1984 to explore the spatial abilities of the professional art school student and to test whether or not such spatial tests given upon entrance to art school had a predictaive validity for the success of the students in their professional programs of study.

BACKGROUND OF STUDY

Beginning in 1984, Eliot and Ho (Eliot, 1988) annually collected spatial test data from all students entering the freshman class at a major mid atlantic art school. Their purpose was to ascertain whether or not a relationship existed between students performance on a variety of spatial test and their success in different art courses. They reasoned that spatial tests with items within and across two dimensions would correlate with courses which required students to work with two and three dimensional materials.

When the stimulus dimensionality of test content has been investigated (Thurstone, 1941), (Burt, 1949) (Guilford, 1967) and Ho (1974). Gutman (Gutman, 1982). the results of those studies typically have been constrained by the narrow range of items and limited number of spatial tasks employed. Contrary to expectations, there have been very few empirical studies which have examined explicity the question of to whether a relationship exists between the stimulus dimensionality of spatial tasks and the performance in art courses within the environment of the professional art school. (Eliot, 1988) (Ho,1974) (Maffie,1940)

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A battery of paper and pencil spatial tests were selected which were thought to include a representative range of spatial tasks.

The final form of The Spatial Dimensionality Test consisted of the following 8 subtests:

hidden figures (12 items from ETS test)
card rotations (14 items with 112 different tasks)
paper folding (10 test items from Guilford test)
Eliot Price Rotations test(9 items)
Stump Perspectives test (12 items)
copying (32 items)
verbal scores (18 items form ETS test)

These 8 subtest scores were grouped into different sum scores that allowed us to explore relate to specific behavorial dimensions that have been identified in the art education literature as being relative to perfomance in art and in art education. (Mc Whinnie, 1965)

The sum score groupings are as follows:

(A) within two dimensional tasks (2 dim score)

hidden figures card rotations

(B) across two dimensional tasks (3 dim sum score)

paper folding surface development

In addition the 8 sub tasks were grouped by Eliot and Smith (1983) into two general catagories which included items requiring:

(A) recognition behaviors (FI scores)

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copying. embedded figures. visual memory. form completion
form rotation

(B) manipluation behaviors (F D scores)

block rotations. surface development. paper folding
+perspectives

For purposes of our 1990 data set analysis, a set of sum scores that crossed over the four major catagories were devised and tested.

By grouping the scores from the 8 subtasks into different catagories were able to present a pictorial profile of the professional art student that would related better to the mode of evulation that is employed by the art school faculty.

Data from these tasks included:

two dimensional score
three dimensional score
F I score
F d score
rotations
perspective

SEX RELATED DIFFERENCES

There were no significant sex- related diffrences on the 1984 nor upon the 1987 test samples. Although there were no significant t test differnces on the spatial test battery, it was noted that the female subjects had lower mean scores then did the male subjects on all of the spatial tasks with

the exception of the verbal scores which of course were not a spatial task. These research findings did not support other empirical studies done on non art school students that had demonstrated consistent and reliable sex-related differences on these tests of spatial abilities. (Harris. 1981; Maccoby and Jackson, 1974;and M Gee, 1979)

The considerable variance between our data and the published literature stimulated the special focus of this research paper. The question we have poised was does the pattern of gender related differences on the spatial tasks persist in our 1990 data set? How do these differences relate to the career of the female students at the art school? Do these differences effect the manner in which the female students are perceived by the art faculty? These are all some of the larger questions which will be attempted in not only this specific study but with future research that is planned in subsequent years with the same general art school populations.

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METHOD

197 students in the 1990-91 school year at a professional art school were tested on the battery of 8 subtests in groups of 25 students. The testing took place in 9 design classes and took one hour of class time on the first day of classes at the art school. At the end of the first semester each of the design course teachers were asked to rate their students for the top five and the bottom five in course performance and the teacher ratings were compared with the test scores. The process of teacher ratings had two purposes: a) to involve the art faculty in the study, and b) to be able to compare teacher ratings with the top, and bottom five students for each of the nine design classes in terms of the spatial test scores.

The students indicated their responses on a standard machine scorable answer sheet with the exception of : card rotations, surface development, and the copying task which were done on the test booklet.

Data was analysed by spss-x correlational, chi-square, and variance analysis programs employed in the analysis of the data on the specific variables that were selected for study in various parts of the general research project.

DATA ANALYSIS

RELIABLILITY DATA FOR THE 1990 DATA SET

embedded figures test alpha r = .6285
paper folding alpha r= .5675
EPR rotations alpha r= .6249
SFP perspective test alph r= .5687
verbal task alpha r= .8541
card rotations a alpha r= .9018
card rotations b alpha r= .9124
surface development alpha r= .9081

In most cases these reliability figures were consistent with the data obtained from previous studies with this specific testing instrument.

(insert table one here) (Means and s d for male and female students in 1990 data set)

In our analysis of the 1990 data we found significant sex-related differences with higher male mean scores on the following subtasks:

card rotations
surface development
Eliot Price rotations
SFP perspectives
copying
total composite score

(INSERT TABLE TWO HERE) (Means and sd across data sets)

The data reported in table two differs from the results from the 1987 data set and the 1986 data as discussed and presented by Eliot (Eliot, 1988) .

How different are each of the data sets that have been generated to date by the art school samples? Given the reported reliabilities for the test as a whole and from the specific subtests, it would seem that the observed differences might be a consequences of group differences or the specfic testing conditions under which these early data collections were made.

The testing conditions for the 1990 data set was in small groups of 25 students each whereas: the testing conditions for the earlier data test samples were in a large group of 200 students as a part of a general orientation program. Some of the students did not take the full test batteries and the motivations to perform on the test were less then adequate when the testing instrument was administered in the large group setting as observed by the researchers based upon comments given by the students after the testing session was over. In the 1990 data collection the test was given in the design classes on the first day of the semester and the positive attitudes of the teachers and the students were noted by the researchers during the actual test period.

Almost all of the students finished the testing in the 1990 data sample whereas; in the data collections that had been made in the previous years there were some who did not finish the test or even refused to do parts of the test.

While we did not test for differences between the three data sets, it does seem that in spite of differences between the mean test scores, they are not of the magnitude of difference to be significant although they did indicate a clear trend or pattern that seems to be consistent with the data from our 1990 sample group.

(insert table three here) (T test results for sex-related differences)

Are there any patterns in our test data? What might the consequences of such patterns for the art education concerns of the professional art school and how might the foundational year be structured to better suit the student both male and female?

These are all significant open questions which will be explored with the art school faculty and will be used to guide future collections of test data both with the 1990 sample group and with groups of students in subsequent years.

SOME POSSIBLE PATTERNS IN THE 1990- DATA SET

least variance in data sets

eft
verbal
card rotations
paper folding
sfp perspectives
copying

ANALYSIS OF SPECIFIC SUBTEST SCORES

within two dimensional tasks (sum 2d)
eft, copying, rotations, paper folding

1990 data set mean 157.7 sd 50.3
high group 205. low group 104.

across two dimensional tasks (sum fd)

paper folding , surface development

1990 data set mean 17.8 sd 8.1
high group 25.9 low graoup 9.7

recognition tasks (sum fi)
eft, copying, rotations

1990 data set mean 28.2 sd 9.9
high group 38.0 low group 19.0

manipulation tasks (sum fd)

1990 data set mean 17.8 sd 8.1
high group 25.9 low group 9.7

(low and high groups in the above refer to those numbers used to assign subjects to either the top five or the bottom five.) (The standard deviations were used to set the ranges for these scores.)

SUMMARY AND SUGGESTIONS FOR FUTURE RESEARCH

Since this is an ongoing research study the observed sex-related differences will be explored in both new collections of data for the 1991 class and in the follow up studies with both the 1989 data set and the 1990 data set. It is our intention to follow the course of these student over the next four years based upon their performances in the annual student shows, in the final senior shows, and by an analysis of their grades during the four years of professional art education.

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